High in-hospital and post-discharge mortality in patients with a pre-existing diagnosis of heart failure hospitalized due to COVID-19

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INTRODUCTION

The increase in morbidity and mortality related to COVID-19, and the number of unexpected deaths during the SARS-CoV-2 pandemic is alarming. Even in the pre-pandemic period, patients with heart failure (HF) were at an extremely high risk of death, as half of them died in four years since diagnosis [1]. Moreover, the transition phase after hospital discharge is also a vulnerable period of increased mortality and hospital readmission [2]. In the pandemic era, the number of urgent hospital admissions due to HF decreased, which resulted in higher in-hospital death rates [3, 4]. For that reason, patients with HF require special attention and care. An expert opinion of the Heart Failure Working Group of the Polish Cardiac Society was published in May 2020 to provide current guidance on COVID-19 management in HF patients [5]. The management of HF during the COVID-19 pandemic was evaluated in the national survey [6]. It showed that the number of highly specialized procedures in patients with HF and the number of hospital admissions due to acute HF decreased during the pandemic, which might have an impact on HF prognosis. We aimed to analyze in-hospital and post-discharge mortality in HF patients during the pandemic to verify the hypothesis that the transition phase is the most vulnerable and unevaluated period in HF management in terms of mortality.

METHODS

The study was designed as a retrospective analysis of the SILesian CARDiovascular (SILCARD) Database. The rationale and detailed information on the database and eligibility criteria were published previously [7, 8]. In brief, the database gathers records of all cardiovascular hospitalizations from the public hospitals in the Silesian Province, Poland. The region is inhabited by 4.5 million citizens (12% of the country's population). The diagnosis of HF was defined as any "I50" code according to the 10th revision of the International Classification of Disease (ICD-10) reported to the National Health Fund (NHF) before the COVID-19 hospitalization. The information on the COVID-19 hospitalizations and all-cause death (follow-up) was provided by the NHF, which manages Poland's entire public health insurance system.

Quantitative data are presented as means (standard deviation [SD]) or medians with interquartile ranges (IQR). Qualitative data are presented as frequencies. The Shapiro-Wilk test was used to determine whether random samples came from a normal distribution. The chi-square test with Yates' correction was used to compare categorical variables. The unpaired t-test was used to compare normally distributed continuous variables between groups. The Mann-Whitney U test was used to compare continuous variables with a distribution other than normal.

Table 1. Baseline and clinical features of the studied populations

	All patients (n = 4 453)	Without HF (n = 2 846)	With HF (n = 1 604)	*P*-value
Age, years, n (%)	72.3 (12.4)	70.2 (13.0)	76.2 (10.2)	<0.0001
Female sex, n (%)	1914 (43.0)	1206 (42.4)	708 (44.1)	0.29
Chronic coronary syndromes, n (%)	2035 (45.7)	1072 (37.7)	963 (59.9)	<0.0001
History of myocardial infarction, n (%)	507 (11.4)	270 (9.5)	237 (14.7)	<0.0001
Hypertension, n (%)	3276 (73.6)	2010 (70.6)	1266 (78.8)	<0.0001
Diabetes mellitus, n (%)	1700 (38.2)	949 (33.3)	751 (46.7)	<0.0001
Atrial fibrillation, n (%)	964 (21.6)	383 (13.5)	581 (36.2)	<0.0001
History of stroke, n (%)	758 (17.0)	525 (18.4)	233 (14.5)	0.001
Prior PCI, n (%)	480 (10.8)	221 (7.8)	259 (16.1)	<0.0001
Prior CABG, n (%)	72 (1.6)	29 (1.0)	43 (2.7)	<0.0001
COPD, n (%)	564 (12.7)	268 (9.4)	296 (18.4)	<0.0001
Asthma, n (%)	469 (10.5)	264 (9.3)	205 (12.8)	<0.0001
CKD (stage 3 or higher), n (%)	708 (15.9)	337 (11.8)	371 (23.1)	<0.0001
Renal replacement therapy, n (%)	169 (3.8)	106 (3.7)	63 (3.9)	0.8
Cancer, n (%)[a]	1330 (29.9)	880 (30.9)	450 (28.0)	0.045
Length of COVID-19 hospital stay, days, median (IQR)	10 (3–20)	10 (3–20)	10 (3–19)	0.26
In-hospital death, n (%)	1289 (28.9)	713 (25.1)	576 (35.8)	<0.0001
Post-discharge follow-up, days, median (IQR)	61 (27–89)	65 (33–91)	52 (17–86)	<0.0001
Post-discharge 6-month mortality, n (%)	690 (15.5)	375 (13.2)	315 (19.6)	<0.0001
Overall mortality, n (%)	1979 (44.4)	1088 (38.2)	891 (55.4)	<0.0001

[a]History of or current cancer

Abbreviations: CABG, coronary artery bypass surgery; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019; HF, heart failure; PCI, percutaneous coronary intervention

The study met the requirement of the Helsinki Declaration. In line with the Polish law on patients' rights regarding data registration, informed consent was obtained from the patients. The approval of the institutional review board on human research was waived, given the observational study design for analyzing recorded data.

RESULTS AND DISCUSSION

The study included 4 453 patients from the SILCARD Database hospitalized with COVID-19 between March and December 2020. The median follow-up was 72 (47–95) days. The study population was divided into two groups based on the HF diagnosis before the COVID-19 hospitalization: patients without HF (n = 2 845) and patients with HF (n = 1 607). The number of patients with a new diagnosis of HF during the COVID-19 hospitalization was 123 (2.8%) and was more frequent among patients who died during the hospital stay (76 [2.4%] vs. 47 [3.6%]; $P = 0.028$, respectively). Patients with HF were older and had more comorbidities, but the sex distribution and length of hospital stay did not differ between groups (Table 1). The in-hospital mortality rate was higher (relative difference 30%) in HF individuals than patients without HF (35.8% vs. 25.1%; $P < 0.0001$, respectively). The difference was even more significant (relative difference 48%) in the post-discharge period, as mortality in the HF group was 19.6% compared to 13.2% in the non-HF group ($P < 0.0001$). The overall mortality was 31% higher in the HF group (55.4% vs. 38.2%; $P < 0.0001$). The diagnosis of HF was more often found in patients who died than survivors (45.2% vs. 28.9%, $P < 0.0001$, respectively).

In the previous analysis from our database, the in-hospital and post-discharge mortality following COVID-19 hospitalization in patients with cardiovascular comorbidities was 30.1% and 11.8%, respectively. The estimated 6-month post-discharge mortality rate was 21.0% [8].

In other studies, increased in-hospital mortality in patients with HF hospitalized with COVID-19 was reported. Tomasoni et al. [9] showed that in-hospital death occurred in 41.1% of patients with HF history and 20.9% of those with no HF history, and HF history was an independent predictor of in-hospital mortality. Similar observations were made by Castagna et al. (in-hospital mortality 49.0% vs. 27.2% in patients with and without a history of HF; $P < 0.001$), with no differences between preserved and reduced left ventricular ejection fraction [10]. The mortality during hospitalization for COVID-19 in patients with a history of HF was significantly higher even after the propensity score matching (39.2% vs. 15.4%; $P < 0.001$), which was associated with a longer stay in an intensive care unit and an increased risk of mechanical ventilation [11]. In the large cohort study in patients with HF history, the in-hospital mortality during COVID-19 hospitalization was 24.2%, compared with 2.6% in acute HF (non-COVID-19) and 4.5% in non-HF (non-COVID-19) hospitalization. The in-hospital mortality during COVID-19 hospitalization in patients without the HF history was 14.2% [12].

The observations regarding the post-discharge period were not consistent. Patients with pre-existing HF had higher 30-day mortality (5.4% vs. 1.5%) and admission (18.5% vs. 8.4%) rates after diagnosis of COVID-19. These findings were similar in patients with preserved and reduced left

ventricular ejection fraction and remained significant after adjustment for age, sex, race, and medical comorbidities [13]. However, in the propensity score-matched cohort, patients with a history of HF had similar 60-day mortality as patients without pre-existing HF after hospital admission due to COVID-19 [14]. For that reason, our study provides important data on very high post-discharge mortality in COVID-19 patients with a history of HF.

To conclude, patients with pre-existing HF hospitalized due to COVID-19 are at high risk of in-hospital and post-discharge mortality in six-month follow-up.

Article information

Conflict of interests: None declared.

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